Research Paper | Education | E-ISSN No : 2454-9916 | Volume : 2 | Issue : 10 | Oct 2016

TEACHER QUESTIONING BEHAVIOUR AND STUDENTS' PARTICIPATION IN MATHEMATICS CLASSES IN BOTSWANA

Sichinga, K.T. [1] | Mfuni, J.H.C [2] | Nenty, H.J. [3] | Chakalisa, P. [4]

[1] Mogoditshane Senior Secondary School, P/Bag 0044, Mogoditshane, BOTSWANA.
[2] University of Malawi, Kamuzu College of Nursing, P/Bag 1, Lilongwe, MALAWI.
[3] Educational Foundations, P/Bag UB 00702, University of Botswana, Gaborone, BOTSWANA.
[4] Mathematics and Science Education, P/Bag UB 0022, University of Botswana, Gaborone, BOTSWANA.

ABSTRACT

Student participation remains a critical component of teaching in an attempt to improve student learning and achievement. With declining quality of student performance in National examinations at school level, consistent attempts to evaluate teachers' behaviour in classrooms are imperative. This study examined the level of student participation in mathematics lessons at senior secondary school level. The investigation also included how teacher questioning behaviour influences student participation with emphasis on how teachers distributed the questions amongst the students and the level of difficulty of the verbal questions asked in mathematics classes. A random sample of 53 teachers of mathematics and 306 students from private and public senior secondary schools was used. Data were analysed using population t test on a single mean, independent t test and one way ANOVA. The results suggest that there is high level of student participation in mathematics lessons at senior secondary school level. Furthermore the study revealed that high level of question difficulty as perceived by students as well as fair and equitable distribution of questions tended to promote student participation.

KEYWORDS: Teacher questioning behaviour, student participation, senior secondary school. Class participation, student involvement

Introduction

The concept *student participation* has been used interchangeably with class participation, student involvement, and classroom participation by different researchers (Parker, Hoopes & Egget, 2011; Zaremba & Dunn, 2004). Broadly speaking, there are two forms of student participation. Student participation may either be verbal output or collaborative activity. Verbal form of participation includes responding to questions, reading aloud, reciting, asking questions, and making comments. The other form of class participation involves students working collaboratively in class. For example, students may engage in group work, debates, discussions, sharing ideas, games, and presentations (Tatum, Schwartz, Schimmoeller & Perry, 2013; Girgin & Stevens, 2005). A number of researchers have confirmed that student participation increases levels of student learning. For instance, Wyatt (2009) and Christle and Schuster (2003) assert that class participation tends to increase students' understanding as well as improve their performance. Similarly, O'Connor (2013) argues that active students' engagement results in optimal learning. Moreover, class participation has been linked to the development of critical thinking. For example, from their observational study of faculty-student interaction, Tatum, et al. (2013) found that critical thinking behaviour increases with higher degrees of participation.

Theoretical Background.

This study was informed by the theories of social constructivism, intelligence and self-efficacy. The theory of social constructivism advocates the importance of students' participation in their learning process. Constructivists claim that knowledge cannot be instructed (or transmitted) by a teacher. But it can only be constructed by the learner (McLeod, 1990). The theory views learning as an active process in which learners attempt to resolve problems they encounter. This view emphasises that the teaching-learning process is interactive in nature; and that it involves the implicit and explicit negotiation of meanings. In addition, social constructivists also advocate for face-to-face communication, whereby implicit mutual understandings are established. They insist on instruction that requires a learner to construct his or her own interpretation of teachers' often implicit instructional messages. Such a mutual communication between a teacher and student to be developed and sustained requires tactiful teaching behaviour.

The theory of intelligence claims that students' beliefs about their intelligence have a bearing on their perseverance in their learning tasks which ultimately determines their level of participation in class. The theory explains that some students avoid challenges in their learning process and that is why they don't participate in class. According to Dweck (2000), such students require easy successes to maintain motivation and participate in class. The students tend to be concerned with performing and looking smart. They rely on tasks that offer limited challenge to be able to participate. This theory explains why some students avoid challenges in their learning process as they see them as threats. Therefore, it is incumbent upon the teachers to vary the difficulty level of the learning tasks in order to encourage such students to participate.

The other theory related to this study is the self-efficacy theory, which holds that students who are efficacious (perceive themselves as capable) are more likely to be self-regulating (where self-regulatory behaviours include decoding tasks, perseverance, seeing difficulties as opportunities, and learning from mistakes). Seifert (2004, p. 140) defines Self-efficacy as "a construct synonymous with confidence that refers to a person's judgment about his/her capability to perform a task at a specific level of performance". Such persons are more strategic and metacognitive than those who do not feel efficacious. According to Bandura (1993) and Dweck (2000), students who are not confident or perceive themselves as incapable may avoid tasks that are seen as challenging or difficult, while those who are highly efficacious will be more willing to face difficult or challenging problems. The theory explains that low achievers usually avoid challenging learning tasks or problems as opposed to higher achievers because they are less confident and less persevering. Thus, the different levels of students' participation in a classroom could be attributed to their self-efficacy. Therefore, teachers need to define students' levels of confidence in their subjects and instill more confidence through appropriate pedagogical approaches in order to maximize class participation.

Problem and Purpose of the Study.

Limited participation has detrimental consequences on students' academic performance. The goal of increasing student participation is not to have every student participate in the same way or at the same rate, but to create conditions that enable students of various learning styles and personalities to participate. The teacher's goal is to create an environment in which all participants have the opportunity to learn and in which the class explores issues and ideas in depth and from a variety of perspectives or viewpoints. To achieve this goal, teachers need to take extra steps to encourage the quiet students to speak up and ask the more verbose students to hold back from commenting in order to give others a chance. However, many teachers seem to turn a blind eye to this goal and perpetuate limited students' participation in their learning process (Gross, 2007). In particular, teachers of mathematics seem to have challenges in maximizing student participation in their lessons. Therefore, the purpose of this study was to establish how the distribution of oral questions and the level of difficulty of the questions influenced student participation in Mathematics classes in senior secondary schools in Botswana.

Research Hypotheses

The following three research hypotheses were stated to guide the study:-

H_1: In the views of students and teachers, students in senior secondary schools in Botswana participate significantly during mathematics lessons.

H_2: The distribution of questions has a significant influence on students' participation in mathematics lessons at senior secondary school level.

H_3: The level of difficulty of questions has significant influence on students' participation in mathematics lessons at senior secondary school level.

Literature Review

Factors that Influence Students' Participation

Studies have found several factors that influence students' participation. The factors include class size, teacher-student interaction, teaching styles, classroom climate, seat location and student attributes. For example, Weaver and Qi (2005) found that large classes permit the strategic withdrawal by a majority of students. Seals (2010) found that a teacher-student relationship of mutual respect outside the classroom setting diminishes the obstacles to communication and encourages student participation in class. Foster, et al. (2009) investigated the influence of teaching styles on student participation, and found that teaching styles that motivate the students usually encourage class participation. This led them to the conclusion that when a teacher used teaching styles that make students see clearly the connection between what is being taught and the issues in their own lives, they become more actively engaged.

Seat location has also been found to have significant influence on student participation. In their study about the effect of seat location on participation at the Brigham Young University, Parker et al. (2011) found that the position where a student sat in class contributed to his or her participation. They established that students seating at the front of the class participated more than those at the back. In addition, the teacher's gender has also been found to have some influence on student participation. From their study conducted at Goucher College, Tatum, et al. (2013) found that female instructors were more interactive than male instructors. Moreover, they also found that large numbers of male students in a class created the "chilly climate" for female students. The "chilly climate" is a situation whereby female students feel less sense of respect and belonging. This affects their desire to participate in class. In a related study, Weaver and Qi (2005) found that students' personal attributes such as gender, age, confidence, readiness have substantial influence on their participation in class.

Mathematics Discourse Strategies

Research has associated specific mathematical discourse strategies with certain levels of student involvement in class. Turner, Cox and Dicintio (1998) used students' self reports of involvement in mathematics and related them to instructional strategies observed in their upper- elementary classrooms. The study revealed that strategies with less student involvement have this teaching sequence: the teacher initiates, then responds to students' queries, and then evaluates students' work. In this process of Initiation - Response - Evaluation (I - R - E) the teacher evaluates student's response as right or wrong, asks a known- answer question, and then establishes the authority of the textbook and himself/herself. In addition, there are teaching procedures where a teacher gives directions, implements procedures, and tells students how to think and act. In all these procedures there is very minimal student participation.

However, in discourses with high students' involvement, teachers give intrinsic support where students view challenge or risk as desirable. Turner, Cox and Dicintio (1998) also revealed that in high-involvement classrooms teachers scaffold instruction. They negotiate understanding, transfer responsibility, and foster intrinsic motivation.

Teacher Questioning Behaviour

Research has consistently highlighted how the distribution of questions, length of wait time, and cognitive level of questions affect students' participation in class. For example, Bond (2007) reports that teachers tend to give students less than a second to respond to a question. Yet most studies suggest that a minimum of three to five seconds wait time increases student's responses. Zares (2007) also observes that effective teachers wait for three seconds before saying something to the student, but on average most teachers wait for one to one and half seconds. This practice discourages students from responding effectively and consequently reduces active participation in class.

Furthermore, Zares (2007) and Cotton (1999) reported that increasing wait-time beyond three seconds is positively related to improvements in the student achievement and confidence. With more than three seconds wait-time, teacher's questioning behaviour has been influenced. Teachers increase their flexibility in their responses. They listen more and engage students in more discussions. Several studies indicate that for lower cognitive questions, a wait time of three seconds is most positively related to achievement, with less success resulting from shorter or longer wait-times. There seems to be no wait-time threshold for higher cognitive questions. Students become more engaged and perform better when the teachers are willing to wait longer.

Research shows that teacher practices such as appropriate manipulation of the placement and timing of questions, probing, prompting, redirection and reinforcement strategies enhance students' participation in class. For example, Zares (2007) posits that a sequence of effective teacher's questioning behaviour should be as follows: ask a question → call on the student → allow the student time to think → listen to the student's response → provide feedback. She argues that it is only then that the students would be active participants in the learning process. In addition, responding to a question in a chorus or as individuals enhances participation. Some researchers have argued that when answering in a chorus, students feel more secure, especially in cases where their responses are wrong (Bandy, 2000).

Distribution of Questions

Most students welcome the teacher questioning that foster their learning. Yuen (2000) found that about 71% of the students value good questions and they regard a 'good' question from a teacher to have clarity, relevancy and stimulating. In an attempt to encourage more students to ask and answer questions, teachers should call upon different students at random. Bond (2007) suggests that effective educators interact with all the students in class and this practice keeps them all engaged during the lessons. The elements of surprise and uncertainty are some of the ways to 'keep students on their toes' during lessons. In their research, Jones and Jones (2004) found that low achieving students need to feel some level of success. This could be done by giving them appropriate feedback for their answers. They argue that if teachers asked questions that were at the appropriate level for each student more students would participate in class. Brophy and Good (1997) recommended that teachers should aim at having 75% of their questions eliciting correct responses as this would motivate students and make them more willing to remain intellectually engaged with the teachers.

According to Cotton (1999) posing questions before reading and studying material is effective for students who are older, high ability, and/or known to be interested in the subject. In addition, very young children and poor readers tend to focus only on material that will help them answer questions if the questions are posed before the lesson is presented. This suggests that teachers need to be sensitive in their timing and placement of questions in the classrooms. They should consider individual students' age, interest and ability when posing questions.

Difficulty Level of Questions

A number of studies have shown that teachers often ask lower order questions. For example, Williams, Alley & Henson (1999) found that 95% of teachers' questions were classified as low-level as they required a "yes" or "no" response. Cazden (1988) argues that most times teachers ask questions at the lower level of the Bloom's taxonomy, answer their own questions, and interrupt students' responses just because the level of difficulty of questions is not appropriate. Cazden further suggests that teachers need training in questioning skills, so that they see the need to emphasize the development of students' skill in critical thinking rather than in learning and recalling facts. Gall (1970) reported that about 60% of teachers' questions require students to recall facts, about 20% require students to think, and the remaining 20% are procedural.

In their study in Botswana Junior Secondary schools, Fuller and Snyder (1991) found that in a vast number of classes students rarely speak up in class. In most classrooms the teachers were vocal and dominant, but the students were always silent and passive. This led them to the conclusion that this was so because the teachers asked closed-ended questions that, demanded simple recall of facts.

Method

Research Design

A descriptive survey design employing quantitative methods of data collection and analysis was found to be the most suitable for this study. This was because according to Nenty, Adedoyin, Odili and Major survey research involves a comprehensive look over, collecting, analyzing and interpreting data that represent phenomena to determine the components, conditions or relationship that exist and the processes or trends that are developing under the tenability of a research hypothesis or a research question.

Population, Sampling and Sample

The target population was students and teachers of mathematics from four Gaborone public senior secondary and four private high schools. Both public and private secondary schools offer two types of mathematics syllabi in Botswana. These are called Core Syllabus for slow learners and Extended Syllabus for fast learners. The purposive sampling was used to select the samples of both the teachers and the students from the eleven senior secondary schools selected for the study. A total of 306 students were sampled for the study, of which 167 were girls and 139 were boys. Fifty three teachers of mathematics were involved in the study, 41 of them came from public secondary schools and 12 from private secondary schools. This represented 66% of the total population of the teachers in the selected secondary schools.

For the students, of the 167 girls, 94 came from public schools and 73 from private schools. Of the 139 boys, 84 came from public secondary schools and 55 from private schools. Thus there were 128 students from private schools and 178 from public schools. This represented 10.2% of the total population of the students in the eleven senior secondary and private high schools in Gaborone. Some 167 students doing the Core Syllabus and 139 students doing the Extended Syllabus were involved in the study.

Instrumentation

The study used two separate questionnaires: one for students and the other for teachers. Both questionnaires had two sections: the first section required respondents to give details of their biographical data like gender, age range, experience, and type of school. The second section of the questionnaire for the students had a four-point Likert scale with 30 closed-ended items. The items were seeking information on level to which student participate in mathematics lessons based on their perceptions and levels of questions difficulty. The questionnaire for teachers used a five-point Likert scale with 20 closed-ended questions. Simi-

larly the items were seeking data on student participation based on teachers' perceptions and levels of difficulty of questions.

Data Collection.

The researchers secured the permission of and arranged with the school administration to visit the schools and administer the questionnaires at the times that were convenient to both the teachers and the students. The researchers gave the questionnaires to the heads of mathematics departments who passed them to teachers and students to complete. The researchers then went back to collect the completed questionnaires at the times when the teachers had free time. The questionnaires for students were also collected by the researchers at the same time as those for the teachers. The return rate of questionnaires for teachers was 88 %; and for students it was 93 %.

Data Analysis.

Data on student participation was categorized into three levels of student participation based on the responses. Out of the maximum total points of 28 from the 4-point liket- scale; those who scored between 12 to18 (43% to 64%) were considered as indicating poor student participation; 19 to 20 (68% to 71%) as fair and 21 to 28 (75% to 100%) as good student participation.

While three levels of distribution of questions namely poor, fair and good were categorized as follows: Out of 28 points on a 4- point likert- scale, poor distribution was from 16 to 23 (57% to 82%), fair distribution was from 24 to 25 (86% to 89%) and good distribution was from 26 to 28 (93% to 100%).

Similarly data on difficulty of verbal questions was categorized into two levels namely high and low. Out of the maximum total points of 24 on a 4- point likert-scale, those who scored between 11 to 15 (46% to 53%) belonged to low level while those who scored between 16 to 19 (67% to 79%) were categorized as high level of question difficulty.

Descriptive statistical analysis was done on the quantitative data. Statistical Package for the Social Sciences (SPSS) was used. A population t test on a single mean was used to test the level of students' participation in mathematics lessons. The observed value and the expected value could easily be calculated and compared for all the participants at the alpha level of .05. A one-way analysis of variance (ANOVA) was used to analyse and compare the variability in students' participation due to teacher's quality of question distribution. Where a significant difference was observed, Fisher's least significant difference (LSD) multiple comparison test was done to determine the source of the difference between means. Independent t-test analysis was done to test for the significance of the influence of levels of difficulty of verbal questions asked on student participation.

Hypotheses Testing

Each of the three hypotheses were tested in the null form:

H_{01}: *In the view of students and teachers, students in senior secondary schools in Botswana do not significantly participate during mathematics lessons.*

Using students' and teachers' responses, population ***t***-test or *t*-test of single mean analysis was done to test this hypothesis. From students' responses there was an observed mean of 19.59 which was greater than the expected mean of 17.50 (see Table 1). The difference in mean was significant at an alpha level of .05, indicating that the students' participation was significantly high in mathematics lessons at senior secondary school level. The null hypothesis was rejected.

From the teachers' responses based on students' participation, there was an observed mean of 25.17. This was greater than the expected mean of 20.0. The observed mean was significant at alpha level of .05. Hence, from the teachers' perspective, students' participation was significantly high in mathematics lessons at senior secondary school level. The null hypothesis was rejected. The results of this analysis are shown in Table 1.

Table 1
Population t-Test of the Level to Which Students Participate in Mathematics Lessons Based on Students' and Teachers' Perceptions.

Variable	μ	$\bar{X}$	SD	Mean Diff	SE	t	df	p<
Level of students' participation in the view of the students	17.50	19.59	3.43	2.09	.196	10.66	305	.000
Level of students' participation in the view of the teachers	20.00	25.17	3.48	5.17	0.479	10.80	52	.000

The analysis of the data based on both the students and the teachers indicated that there is a significantly high level of students' participation in mathematics lessons at senior secondary school level in Gaborone.

H_{o2}*: The distribution of questions has no significant influence on students' participation in mathematics lessons at senior secondary school level.*

In order to establish whether question distribution during mathematics lesson has a significant influence on students' participation, a one-way ANOVA was carried out (see Table 2). The analysis gave an F-value of 10.70 with a p-value of .000, which is smaller than our alpha level of .05. Hence the null hypothesis was rejected and the research hypothesis retained. That is, in the views of the students, there is a significant influence of question distribution on students' class participation during mathematics lessons.

Different levels of question distribution had different mean scores on students' participation. The poor question distribution had a mean score of 18.50 on students' participation, the fair distribution had a mean score of 19.40 and a good distribution had a mean score of 20.50. The results suggested that good question distribution leads to higher students' participation in mathematics lessons. The results of this analysis are shown in Table 2.

Table 2.
One way Analysis of the Variability in Students' Classroom Participation Due to Teacher's Level of Question Distribution as Perceived by Students and by Teachers

Variable	Quality of Question Distribution	n	Mean	Std. Dev.	Std. Error	Source of Variation	SS	df	MS	F	Sig.
Students' Perception of Level of Class Participation	Poor	100	18.50	3.13	.313	Between Groups	236.36	2	118.18	10.67*	.001
	Fair	72	19.40	3.37	.397	Within Groups	3355.58	303	11.08		
	Good	134	20.50	3.45	.298	Total	3591.94	305			
	Total	306	19.60	3.43	.196						
Teachers' Perception of Level of Class Participation	Poor	19	24.47	3.95	.906	Between Groups	16.47	2	8.24	0.67	.516
	Fair	14	25.86	2.68	.718	Within Groups	1240.82	50	12.30		
	Good	20	25.35	3.56	.796	Total	1268.51	52			
	Total	53	25.17	3.48	.479						

In order to establish if the mean differences of quality of question distribution on student's participation were significant, a post hoc (LSD) test was carried out. The results showed that there were significant mean differences between good and poor, and between good and fair categories. Thus the influence of good question distribution level on students' participation is significantly higher than that of fair and poor levels. The results of this analysis are shown in Table 3.

Similarly, the teachers' responses were also categorized into poor, fair and low question distribution and their influence on students' participation was analysed using ANOVA. The F ratio of 0.670 with an alpha level of .516 ($p > .05$) was found. These results indicated that question distribution had no significant influence on students' participation. The mean score of students' participation due to poor question distribution was 24.47, due to fair

Table 3
LSD Multiple Comparison of Means of Students' Classroom Participation across Qualities of Teacher's Distribution of Questions Based on Students' Perceptions

Quality of distribution of questions (I).	Quality of distribution of questions (J).	Mean Difference (I-J)	Std. Error	Sig.
Poor	fair	-.88889	.51435	.085
	Good	-2.01493(*)	.43976	.000
fair	Poor	.88889	.51435	.085
	Good	-1.12604(*)	.48627	.021
Good	Poor	2.01493(*)	.43976	.000
	fair	1.12604(*)	.48627	.021

* The mean difference is significant at the .05 level.

question distribution was 25.86 and due to good question distribution was 25.35. While the means on students' participation due to fair and good question distribution were higher than that due to poor question distribution, the differences were not significant. Therefore, based on the teachers' responses, the question distribution had no significant influence on students' participation. Thus the null hypothesis was retained. The results of this analysis are shown in Table 3.

The overall result was that good question distribution had positive influence on students' participation. While the data based on the students' responses indicated that the positive influence was statistically significant, the data based on the teachers' responses indicated that the influence was not significant.

***H_{03}**: The level of difficulty of questions has no significant influence on students' participation in mathematics lessons at senior secondary school level*

Data from both the students and the teachers were separately categorized into two levels: low and high levels of difficulty. The mean of students' participation due to low level of difficulty was 19.19, while the mean due to high level of difficulty of questions was 19.97, which was higher. The mean difference indicated that the higher the difficulty level of questions, the more the students participate in mathematics lessons. An independent t-test was done to find out if the influence was significant at alpha level of .05. Based on students' responses, the t-value was -2.014 (see Table 4) which was significant at alpha level of .045 ($p < .05$). That is, the level of difficulty of questions had significant influence on students' participation. The null hypothesis was rejected.

Table 4
Independent t-Test Analysis of the Influence of Level of Question Difficulty on Students' Participation during Mathematics Lesson.

Level of Question Difficulty		n	Level of Students' Participation				t	df	p <
			Means	Std Dev	Std Error	Mean Diff.			
For Students	Low	149	19.19	3.54	0.290				
						-0.787	-2.014	304	.045
	High	157	19.97	3.29	0.263				
For Teachers	Low	28	23.82	3.58	.677				
						-2.86	-3.242	51	.002
	High	25	26.68	2.72	.544				

Similarly, an independent t-test based on teachers' responses was done to find out if the level of difficulty of questions had significant influence on students' participation. The mean of students' participation due to low level of difficulty was 23.82, while the mean due to high level of difficulty was 26.68, which was higher. The mean difference indicated that the high the level of difficulty of questions, the more students participate in mathematics lessons. An independent t-test was then calculated to find out if the influence was significant at alpha level of .05. The t-value was -3.242 which was significant at alpha level of .002 ($p < .05$). The results indicated that the level of difficulty of questions had significant influence on students' participation. The null hypothesis was rejected. The overall analysis indicated that the more the questions of high level of difficulty are asked the more students participate in mathematics lessons.

Summary of the Findings

The study found that there is a high level of students' participation in mathematics lessons at senior secondary school level. Regarding teacher questioning behaviour, good question distribution and a high level of difficulty of questions do increase students' participation in mathematics lessons. However, those students and teachers who participated in this study differed on how important such influences are. That is, while students perceived that the distribution of questions had an influence on students' participation, the teachers did not. Finally, the majority of teachers of Mathematics seem to ask low level of difficulty of questions in their lessons though such questions were perceived as difficult by most of their students.

Discussion

Level of Students' Participation in Mathematics Lessons.

This study found that the level of students' participation in mathematics lessons at senior secondary school level was significantly high. This finding contradicts the findings of Fuller and Syder (1991). Thijs and Berg (2002), who found that teachers in most classrooms are vocal and dominant, while students sit passively and rarely speak up. This contradiction could be explained by the fact that earlier studies were conducted in junior secondary schools, while the current study was conducted in senior secondary schools. It should also be emphasized that students at senior secondary school level have developed higher language and communication skills to be able to participate in the learning process more than those at junior secondary school level.

Moreover, it should be noted that the earlier studies were conducted in junior secondary schools that were located in the rural areas of Botswana,while the current study was conducted in a cosmopolitan city of Gaborone where the self-esteem and self-efficacy of many students are likely to be higher because most of them come from families of educated parents who realize the importance of Mathematics. This observation is supported by Adeyinka (2005) who found that the level of education of parents had a positive influence on the attitude of their children towards mathematics.

Question Distribution and Students' Participation

The study found that the way the questions are distributed in class had a significant influence on students' participation. If the questions were distributed across the students' gender and ability, students' participation increases whether the students raised their hands or not. Moreover, students' participation increased if equal opportunities to answer questions were afforded to both vocal and non-vocal students. It was also found that students' participation increased if all students were prompted to answer questions. This finding is consistent with Hanson (2005) who argued that student participation in their learning process increases when all students are incentivized and have the opportunity to participate.

Furthermore, this study found that random question distribution breaks the gender barriers in the classroom. Gender studies have consistently suggested that girls tend to be less participatory in mathematics and science lessons and that the practice is perpetuated by teacher questioning behaviour (Drzewiecki & Westberg, 2007; Fuller, Hua, & Snyder, 1991; Tatum, et al. 2013). Some teachers seem to believe that the field of mathematics and the sciences is a male domain. Such teachers tend to be biased towards boys (Brophy & Good, 1997; Drzewiecki & Westberg, 2007; Mwetulundila, 2004). But with fair distribution of questions this gender bias is broken and there is more participation by students in class.

The theory on intelligence discussed earlier alluded to the positive impact of fair distribution on participation. Dweck (2000) argued that equitable distribution of questions balances the effects of theory on intelligence. This means that fair distribution of the questions amongst the students is likely to maximize class participation in the learning process.

Difficulty Level of Questions and Students' Participation.

The study revealed that high level of difficulty of questions had a significant increase in student participation. It was found that students' participation increased significantly with higher level of question difficulty. However this finding is inconsistent with the findings of the studies by Cotton (1999) and Sutton and Krueger (2002) who found that in most mathematics classes, especially those above primary grades, the impact of a combination of higher and lower cognitive questions on student participation is more superior than an exclusive use of one or the other.

This contradiction could be due to the different learning styles of students. Students have different learning and thinking styles. For example, learners who have good memories find knowledge questions easier to answer and those who are analytical thinkers find analysis questions easier to answer more difficult ones. This suggests that low order questions motivate slow learners to participate in the learning process, while higher cognitive questions can motivate them to ask more questions (STAMP, 2000+).

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Mathematics teachers in senior secondary schools should be offered in-service workshops on effective questioning styles so that they

a. Are equipped with appropriate skills to be able to distribute questions fairly and equitably when teaching.

b. Ask questions that are at higher level of difficult so that they increase participation of both slow and fast learners.

2. The present study had a limited sample from the city of Gaborone alone. Inevitably, this imposed serious limitations on the generalizability of the findings.

3. For further research, a broader study on teacher questioning behaviour and student participation should be carried out to cover a whole range of the schooling system including primary and junior secondary schools,

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